

XLVI.—On the Limits of the Subkingdom Mollusca.

By Dr. O. A. L. MÖRCH.

THE Vertebrata form the only subkingdom with uncontroverted limits; yet the late Prince Bonaparte considered the Aphanozoa (*Sagitta*, &c.) the lowest Vertebrata.

Since the time of Cuvier, the Tunicata have been considered by zoologists true Mollusca. Professor Huxley has shown that the Bryozoa are inseparable from the Tunicata. The Brachiopoda are considered allied to the former, thus forming the subclass Molluscoidea of several modern authors. Dr. Macdonald\* has lately added the Ctenophora † to the Brachiopoda ‡.

Prof. Lovén first raised a doubt as to the affinity of the Tunicata to the Mollusca, chiefly on account of the form of the larva of Ascidians. Dr. Macdonald founded the same doubt chiefly on the reproduction by budding, which is foreign to the nature of Mollusca. This reason alone cannot be considered sufficient, as there is found in nearly every class a division (subclass, microsthenic division) differing in having an abortive progeny, *e. g.* Marsupialia, Amphibia, Orthoptera among Mandibulata, and Hemiptera and Homoptera among Haustellata, Entomostraca, &c.

The systematic position of the Tunicata seems chiefly to be based on a supposed resemblance between the two apertures of Ascidians with the siphons of Acephala, and a still more superficial resemblance between "the shells."

Another division, containing gelatinous and arborescent forms (the Acalephæ), seems to have a much greater affinity to the Acephala, with which they agree in the four labial palpi and the fringed oculiferous edge of the mantle. This resemblance is very striking if the Acaleph be compared with a swimming *Lima*, as mentioned by Sars. The radiated form indicates the same relation to Acephala as Cephalopoda bears to Gasteropoda. The group Radiata as defined by Cuvier do not really exist. Cnidæ and phlebenterism are found in the Gymnobranchia to a great extent, being dependent on the want of a shell §. The Anthozoa, considered inseparable from the Acalephæ, look no stranger among the Mollusca than the Bryozoa.

There are, however, some other Cœlenterata which may be referred to the Mollusca with still more precision. I have always thought it strange that the Mollusca, although inferior to

\* Transactions of the Royal Academy of Edinburgh, 1864.

† Mörch, Fortegnelse over Grönlands Bløddyr, 1857; Rink, Grönland, p. 97.

‡ Malacozoologische Blätter, vi. p. 104.

§ In *Cyanea* is found a brown membrane reminding us of the *Loligo*-shell.

the Arthropoda, contained only a single true intestinal species (the *Endoconcha* of John Müller), whilst the "Entozoa" have contributed considerably to the Arthropoda, viz. *Lernæa*, *Pelto-gaster*, *Clistosaccus*, *Linguatula*.

The Helmintha are generally divided into two sections,—viz. Nematodes with distinct sexes, and Platyhelmintha with the sexes united. Mr. Bastian\* has, at the last meeting of the Royal Society, on the 15th of June, pointed out that the Nematodes, parasitic and free, are closely allied to the Echinodermata. The Platyhelmintha, containing the Trematoda, Cestoda, and Turbellaria, seem to me not to differ materially from the androgynous Mollusca.

The Turbellarians are united to the Mollusca by Mr. Ch. Girard†, on account of the resemblance of the embryonic state of *Planocera elliptica* with that of *Elysia*. It must, however, be remembered that the "chrysalis" state is not known among the Mollusca, and that all larvæ of Gasteropoda are provided with a nautiloid shell, except the larva of *Chiton*. The Turbellarians differ chiefly from the Gasteropoda in the presence of numerous eyes; but this difference is perhaps not of great importance, as Dr. Bergh has discovered four eyes in a species of *Fidiana* from St. Thomas, and Agassiz‡ indicates that *Margarita* is provided with eyes, at the base of the pedal filaments, corresponding to those in the mantle-edge of *Pecten* and other Acephala. Dr. Bergh, however, has not found any lens in the "eyes" of the pedal filaments in *Margarita*. According to Prof. Hensen, the lens is absent in *Nautilus*.

The nervous system shows no important difference from that of Gasteropoda. The want of a true foot is of no consequence. In *Bulla*§, *Akera*, &c., the locomotion is partly, and in Pelli-branchiata almost entirely, effected by the hind part of the body, the true foot being reduced to a crescent-like disk, not unlike the sucker in many Entozoa. The arborescent form of the intestinal canal, generative organs, and kidneys is common to all animals wanting special respiratory organs.

Salivary glands are present, but the liver is entirely absent, as is usually the case in animals (*e. g.* perfect Insects) living upon food not requiring preparation. The *Taniæ* want even a mouth and intestinal canal, living in a prepared nutrimental juice, which the parasite absorbs through the surface of its skin; a

\* The Athenæum, June 1865, p. 850. [Annals for September, p. 197.]

† Researches upon Nemertians and Planarians. Philadelphia, 1854.

‡ Lectures on Embryology, p. 86, 8vo.

§ Mörch, "Contributions à la Faune malacologique des Antilles danoises," Journ. de Conch. 1863, p. 19.

circulatory system, therefore, would be of no use. The Platyhelmsia seem to me not to differ more from the Mollusca than *Peltoaster* and *Clistosaccus* from the Crustacea. In the entozoic Crustacea some of the harder oral parts are generally preserved, in order to serve the animal for attachment. It is therefore likely that the hooks of Cestoda are homologous with similar hard organs of Mollusca. Gegenbaur\* compares in this way the four uncigerous retractile organs of *Tetrarhynchus* with the cheek-hooks (harpagæ) of the Pteropoda gymnosomata. Perhaps a closer study of the genus *Homoderma* of Van Beneden† (outwardly resembling a *Distoma*, but anatomically agreeing with *Pneumodermon*) may throw some light on this question. The hooks of the Cestoda may also be compared with the lingual teeth of the Pellibranchiata, and chiefly with that part called by Messrs. Alder and Hancock‡ the "prehensile collar" in *Limapontia nigra*. These hooks probably assume a circular arrangement. The lingual teeth are frequently absent among Gasteropoda, e. g. *Doridopsis* (Hancock), *Cirroteuthis* and *Tethys* (according to Bergh).

A secretory organ (kidney) is never absent in any animal taking food; and it therefore exists in all Entozoa, agreeing in form with the renal organ of *Elysia* as represented by Souleyet.

The generative organs of the Platyhelmsia agree exactly with those of the androgynous Mollusca in general, but chiefly with those of the genera § *Chalidis* and *Pelta*; at least I cannot discover any notable difference on comparing the anatomy of the two latter genera with that of *Amphistomum subclavatum* as represented by Dr. Walter||. The Hirudines and Lumbrici, which are considered by Prof. Quatrefages distinct classes, are also androgynous, with reciprocal copulation; but the generative organs, like the nervous system, seem to be formed according to quite another plan, although they may have some distant resemblance to those of *Elysia*. It may be questioned if androgyny is of sufficient importance to unite animals differing so greatly in their exterior form, especially as hermaphroditism is only of specific value among Fishes (*Serranus scriba*) and Acephala (*Pecten opercularis*). I, however, believe that andro-

\* Vergleichende Anatomie, p. 329.

† Exercices zootomiques, 1839, p. 54, t. 3. f. 4-6 (Mém. de l'Acad. Roy. des Sciences de Bruxelles, tome xi.)

‡ Ann. Nat. Hist. ser. 2. vol. i. p. 208, pl. 20. f. 2. Quite different from "the prehensile collar" of the same authors in their 'British Nudibranchiata.'

§ Quatrefages, Mémoire sur les Gastéropodes phlébentérés (Ann. Sc. Nat. 3 sér. 1844, tome i. p. 155, t. 4. f. 4); Möreh, "Contributions à la Faune malacologique des Antilles danoises," l. c. p. 24.

|| Archiv für Naturgeschichte, xxiv. p. 269, t. 11. f. 5.

gyny is of the highest importance in connexion with the other characters mentioned above, as opposed to the vermicular form and white colour—characters common to most burrowing animals and plants.

If this proves correct, there will only remain among the Cœlenterata Lumbrici, Hirudines, Annelida, Echinodermata\*, Nematoidea, Tunicata, Bryozoa, Brachiopoda, Ctenophora, Rhizopoda, Spongiaria. It seems very doubtful whether these divisions together would correspond to the three other subkingdoms. The limits of the second subkingdom, Arthropoda, are much litigated, as the lowest Crustacean does not show the same degradation of the copulatory organs as the Fishes among Vertebrata, and the Acephala among the Mollusca. I therefore consider it probable that the subkingdom Articulata, chiefly on account of the nervous system, ought to be reestablished as it was defined by Cuvier.

---

XLVII.—*Notes on the Palæozoic Bivalved Entomostraca*. No. VI.  
*Some Silurian Species* (Primitia). By Professor T. RUPERT  
 JONES, F.G.S., and Dr. H. B. HOLL, F.G.S.

[Plate XIII.]

IN the 'Annals of Natural History' for August 1855, September 1855, and April 1857 were published descriptions of some Silurian Bivalved Entomostraca, comprising, among others, *Beyrichia* of three types,—“simplices,” “corrugatæ,” and “jugosæ.” The first of these groups, the simple or unisulcate, seems to us now to be deserving of generic distinction, since, among a still larger number of forms, we find a persistent occurrence of the chief features, with a passage towards *Leperditia*, by the complete loss of the furrow, rather than towards the two-furrowed or real *Beyrichia*.

We do not presume, however, that we hereby do more than somewhat improve our classification of these necessarily obscure Silurian Entomostraca, represented only by carapace-valves, always minute and often variable in form and ornament, besides being subject to alterations by pressure and by chemical change, and rarely to be cleared of their matrix on all sides. In some cases, too, we have had to be content with what we could make out of casts and imprints.

There remain, therefore, several difficulties in classifying these little Bivalve Entomostraca—and especially since with the total disappearance of the dorsal sulcus we do not seem necessarily to

\* According to Mr. Williamson, closely allied to the Annelida (British Association Report, 1857).